

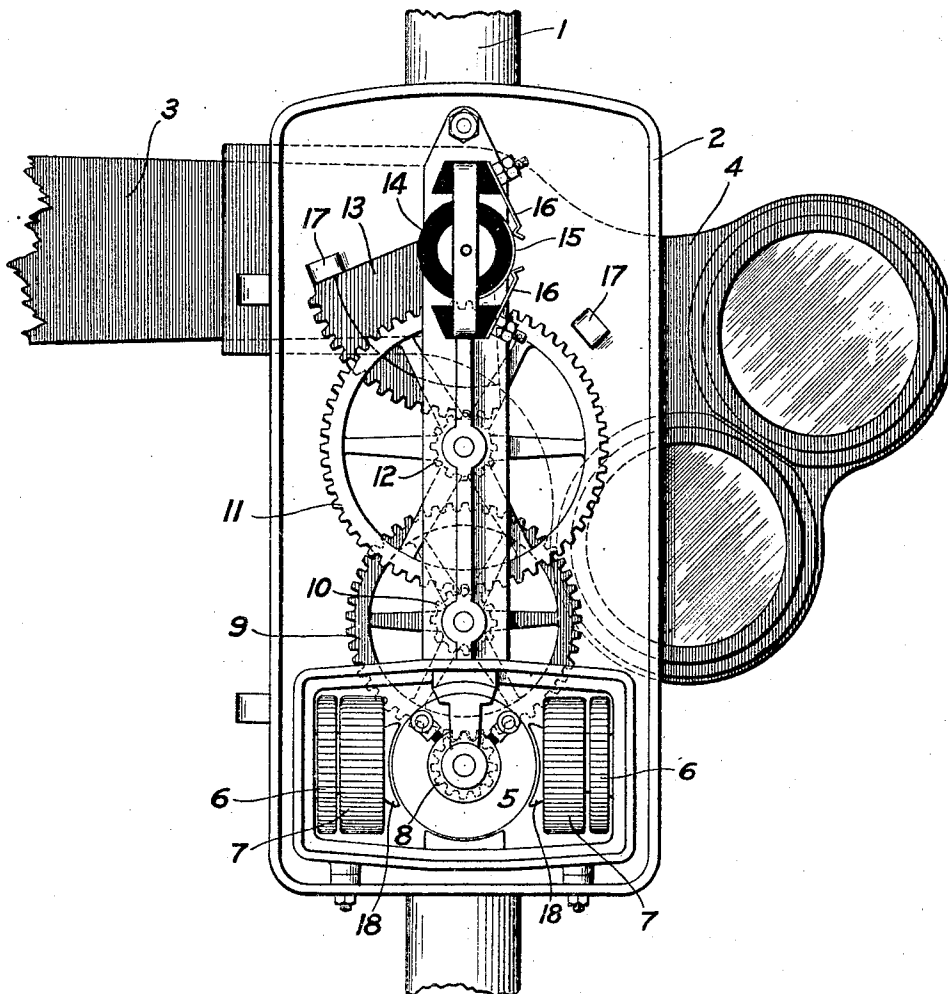
W. K. HOWE.
MEANS FOR OPERATING SEMAPHORES.
APPLICATION FILED APR. 30, 1909.

1,024,853.

Patented Apr. 30, 1912.

2 SHEETS—SHEET 1.

FIG. 1.



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2 SHEETS—SHEET 2.

FIG. 2.

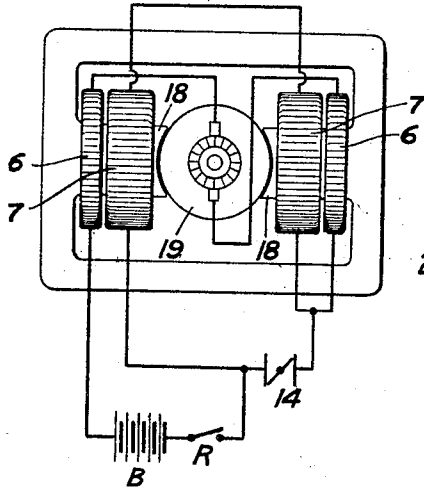


FIG. 3.

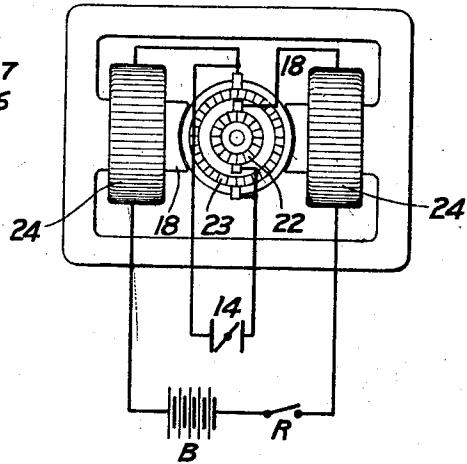
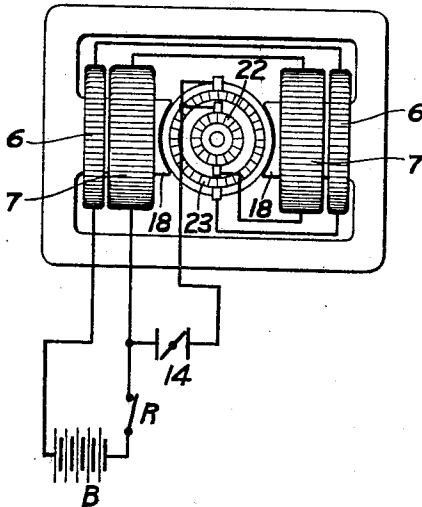


FIG. 4.



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UNITED STATES PATENT OFFICE.

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MEANS FOR OPERATING SEMAPHORES.

1,024,853.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed April 30, 1909. Serial No. 493,216.

To all whom it may concern:

Be it known that I, WINTHROP K. HOWE, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Means for Operating Semaphores, of which the following is a specification.

This invention relates to railway signals, particularly of the semaphore type, which are operated by means of electric motors. In devices of this kind it is necessary, in order to secure rapid and positive operation while at the same time economizing the electric current employed, that the flow of current for maintaining the semaphore in set position be substantially less than that required to move it to such position. To secure this economy in current, two general methods have heretofore been employed. First, when the semaphore was in the set position, current was cut off from the motor and applied to a magnet, this magnet operating a brake on the motor shaft itself, or on some part of the gearing between the motor shaft and the semaphore so as to prevent reverse movement and thus holding the semaphore in the set position. Second, this magnet was made to operate a latch, commonly called a slot, which was so arranged as to prevent the reverse movement and hold the semaphore in the set position. Some of the early patents have shown semaphore signals operated and held by the energized motor without the use of either the brake magnet or the slot, but, as is well known, when an electric motor is brought to rest, and its energization is maintained, the current increases to a point very much in excess of that which was required to set the semaphore. The reason for this is, as is well known, that when a motor is at rest, although energized, there is no counterelectromotive force tending to reduce the flow of current through the motor. When a motor is running, there is a counterelectromotive force which, together with the resistance of the motor, automatically limits the flow of current through the motor to that necessary to do the work required of it. If, however, the motor is brought to rest, and the voltage continues to be applied, the counterelectromotive force mentioned ceases, and the cur-

rent increases very greatly, or, in other words, is then limited only by the resistance of the motor. It is this characteristic of an electric motor that has prevented its use in practice for holding a semaphore in the set position. It is the object of this invention to provide improved means for automatically regulating the amount of energy applied to the motor while the signal is in the set position.

As is well known, the power or torque of a rotary motor is proportional to the product of the magnetic flux, the number of armature conductors, and the current in said conductors. Therefore, if enough torque is to be maintained in the motor to hold the semaphore in the set position, and it is desired to reduce the current, it is obvious that either the magnetic flux or the armature conductors must be increased, or that both may be increased, and one feature of my invention resides in the provision of means for accomplishing this result.

In the drawings:—Figure 1 is an elevation of a semaphore-operating mechanism, with the cover of the casing removed; Fig. 2 is a diagram of the motor arrangement of the mechanism shown in Fig. 1; and Figs. 3 and 4 are diagrams of modified forms of such motor arrangements.

In the embodiment of my invention illustrated in Fig. 1 the semaphore mast 1 supports the casing 2 for the operating mechanism which actuates the semaphore. The semaphore comprises a blade 3 and a spectacle casting, to which the blade is attached in the usual way. Within the casing 2 is a motor 5 having the ordinary operating field coils 6, 6, and two supplementary field coils 7, 7, for a purpose to be described. On the motor shaft is a pinion 8 meshing with a gear wheel 9 carrying a pinion 10 on its shaft, which latter meshes with a gear wheel 11, on whose shaft is a pinion 12 meshing with a toothed segment 13 upon the shaft of the semaphore. The rotation of the motor through the train of gearing swings the segment 13, and so swings the semaphore blade from the normal horizontal or danger position to the usual inclined, safety position. Upon the shaft of the semaphore blade is a switch disk 14 having upon a portion of its periphery a conducting plate 15, which, when

the semaphore is in the danger position, as shown, makes contact with a pair of brushes 16 to make an electric circuit for a purpose to be described. When the semaphore moves to the safety position the conducting strip 15 passes from under the brushes 16, and the circuit through said brushes is automatically broken. It is obvious that the switch may be placed upon any part that is connected to and movable with the semaphore blade in order to be operated in correspondence with the position of the semaphore. Stops 17 in the casing limit the oscillation of the segment 13.

When the motor circuit is broken and the motor is deenergized, the semaphore, being weighted so as to have a bias to the normal or danger position, returns to that position automatically, driving the motor and the train of gears backward.

Of the several ways in which the effective length of winding in the motor may be regulated to effect economy in current consumption while the semaphore is held in the set position by the motor, Fig. 2 shows the preferred form. This consists in placing on the magnetic cores 18 of the motor, beside the ordinary field coils 6, 6, a number of additional turns of wire separate from the ordinary field coils, and forming the supplementary coils 7. The ordinary motor circuit passes from the battery B through one of the ordinary field coils 6, then through the armature 19, then through the other field coils 6, through the normally closed switch 14, through the relay R, whereby the semaphore may be controlled from a distance, and to the battery. Additional circuit wires connect the supplementary coils 7 in series with the ordinary field coils 6, but they are short-circuited when the switch 14 is closed, and are thrown into series with the ordinary field coils 6 when the switch 14 is open. The opening of the switch 14 increases the resistance of the motor by throwing the added turns of wire into the field circuit of the motor, thereby reducing the current that can pass through the motor, and at the same time the number of ampere turns on the magnet is increased, thus increasing the magnetic flux.

Fig. 3 shows another method of increasing the magnetic flux by increasing the armature conductors. Besides the usual armature conductors 22, extra turns 23 of wire on the armature are thrown into series with the normal operating circuit when the signal is in the set position, and this is accomplished in the present instance by opening the switch 14, whereupon the current passes through the field coils 24 and through both sets of armature turns 22 and 23, in series.

In Fig. 4 both the armature conductors and the magnetic flux are increased, the lat-

ter by the supplementary coils 7 on the magnet cores. Fig. 4 shows therefore a combination of the devices of Fig. 2 and Fig. 3.

What I claim is:—

1. The combination, with a semaphore having a normal position, a set position, and a bias to its normal position, of a rotary electric motor for moving the semaphore to and holding it in set position, the motor having the usual windings in its field and armature together with supplementary windings in one of said members, and means controlled by the position of the semaphore for connecting the supplementary windings in series with the usual windings to automatically regulate the energy supplied to the motor while the semaphore is held in its set position thereby, the torque of the armature being sufficient to hold the semaphore in such position after the supplementary windings have been introduced.

2. A semaphore having a normal and a set position and having a bias to the normal; a rotary electric motor for moving the semaphore to the set position having the usual field windings and supplementary field windings; and means controlled by the position of the semaphore for connecting the supplementary field windings in series with the usual field windings for automatically regulating the energy supplied to the motor, the torque of the armature being sufficient to hold the semaphore in the set position when the windings are so connected.

3. A semaphore having a normal and a set position and having a bias to the normal; a rotary electric motor for moving the semaphore to the set position having the usual field windings and supplementary field windings; a switch operated in correspondence with the position of the semaphore; and electric connections controlled by said switch for connecting said supplementary field windings in series with said usual field windings, the torque of the armature being sufficient to hold the semaphore in the set position when the windings are so connected.

4. A semaphore having a normal and a set position and having a bias to the normal; a rotary electric motor for moving the semaphore to the set position and having the usual armature windings and supplementary armature windings; and means controlled by the position of the semaphore for connecting the supplementary armature windings in series with the usual armature windings, the torque of the armature being sufficient to hold the semaphore in the set position when the windings are so connected.

5. A semaphore having a normal and a set position and having a bias to the normal; a rotary electric motor for moving the semaphore to the set position and having

the usual armature windings and supplementary armature windings; a switch controlled by the position of the semaphore; and electric connections controlled by said switch for connecting said supplementary armature windings in series with said usual armature windings, the torque of the armature being sufficient to hold the semaphore in the set position when the windings are so connected.

6. A semaphore having a normal and a set position and having a bias to the normal; a rotary electric motor for moving the semaphore to the set position and having the usual armature windings and supplementary armature windings, and also the usual field windings and supplementary field windings; and means controlled by the position of the semaphore for connecting the supplementary armature windings in series with the usual armature windings and the supplementary field windings in series with the usual field windings, the torque of the armature being sufficient to hold the sema-

phore in the set position when the windings are so connected.

7. A semaphore having a normal and a set position and having a bias to the normal; a rotary electric motor for moving the semaphore to the set position and having the usual armature windings and supplementary armature windings and also the usual field windings and supplementary field windings; a switch controlled by the position of the semaphore; and electric connections controlled by the switch for connecting the supplementary armature windings in series with the usual armature windings and the supplementary field windings in series with the usual field windings, the torque of the armature being sufficient to hold the semaphore in the set position while the windings are so connected.

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Witnesses:

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W. A. JACKSON.